



# Alabama Power – UESC Activities

FUPWG

10-16-12

# UESC Projects

- Anniston Army Depot
  - Re-conductor / New Poles
  - Substation / Switchyard Upgrade
  - Solar Water Heating
- USDA - Auburn
  - Lighting Retrofit
  - Heat Recovery
- FDA
  - Investment Grade Audit
    - Lighting / Controls / Heat Recovery

# UESC Projects

- GSA
  - Lighting Upgrades
    - Mobile and Montgomery Court Houses
- Fort Rucker
  - Generator / Photo Voltaic Project
  - Investment Grade Audit
    - Energy Efficiency Projects
    - Renewables
  - Lighting Sensor
  - Lighting / Controls / Boiler Replacement

Fort Rucker  
Heat Pump / Boiler  
Piggyback System  
50 Ton HPWH  
240 kW Electric Boiler

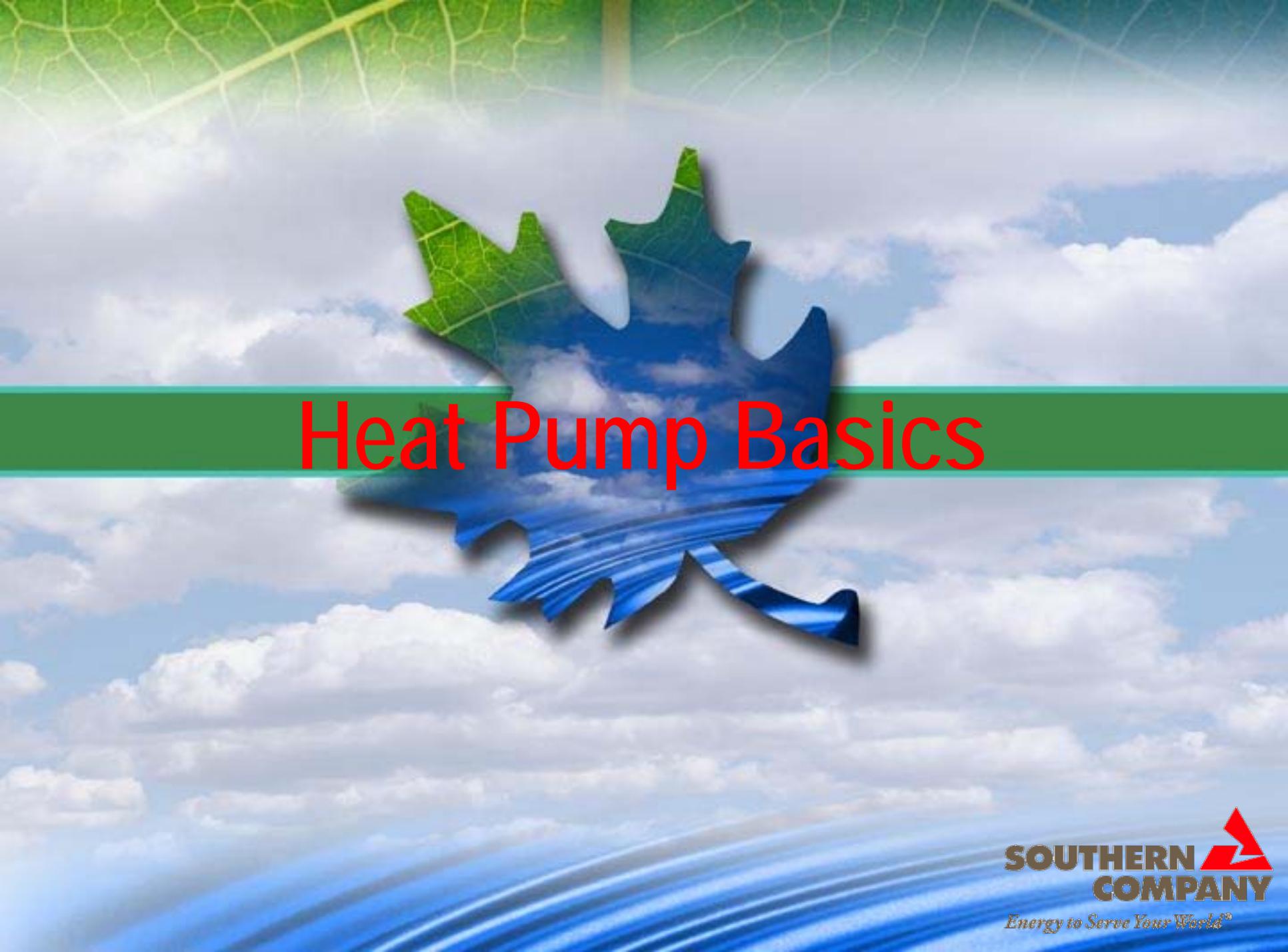




# Heat Recovery

# Questions to Consider...

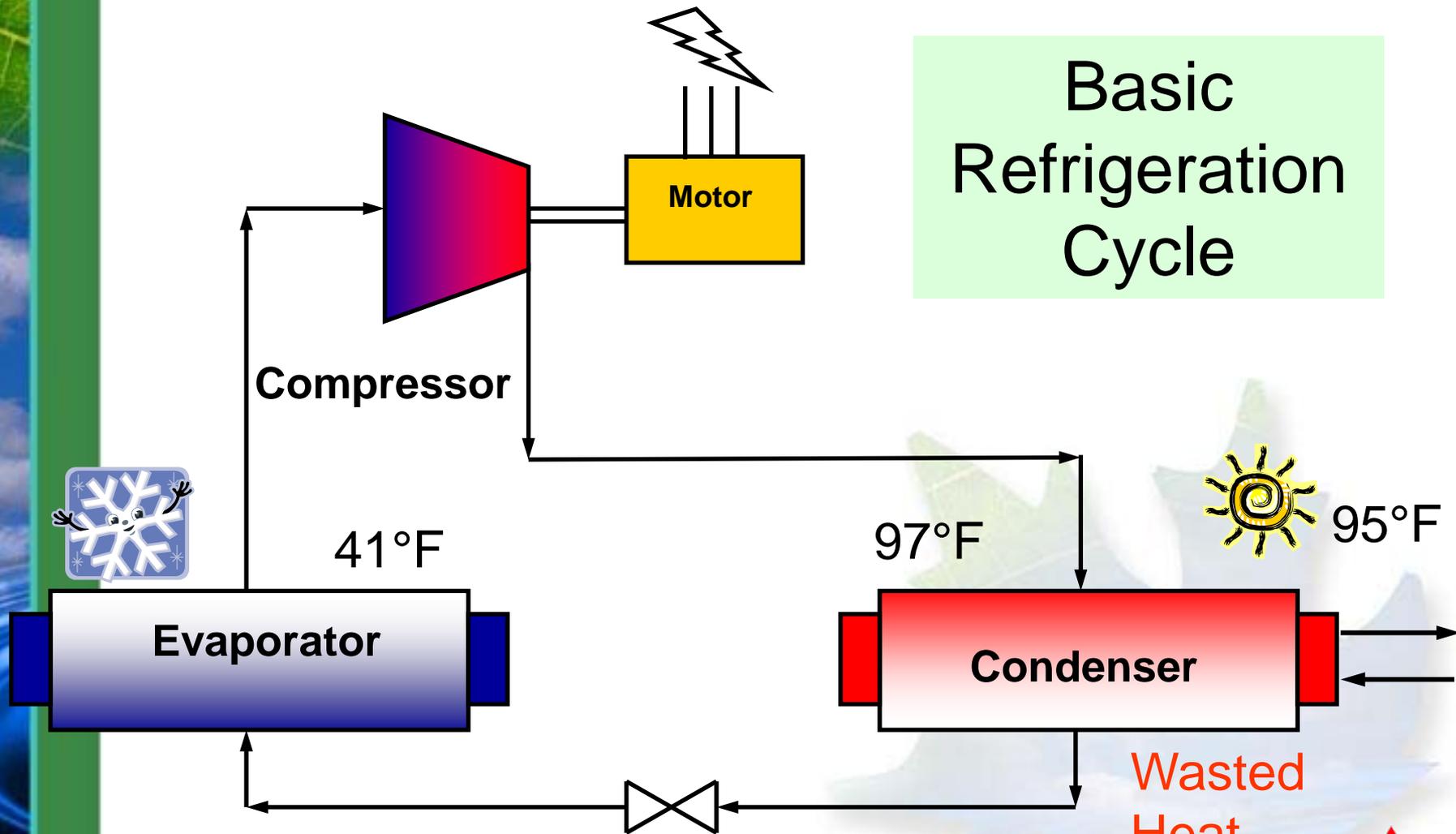
- What is the most efficient boiler you have installed?
- If you were going to reduce Greenhouse gas emissions would you focus on the **Heating** or **Cooling** of a building?
- What is an acceptable energy efficiency ROI for a capital investment?



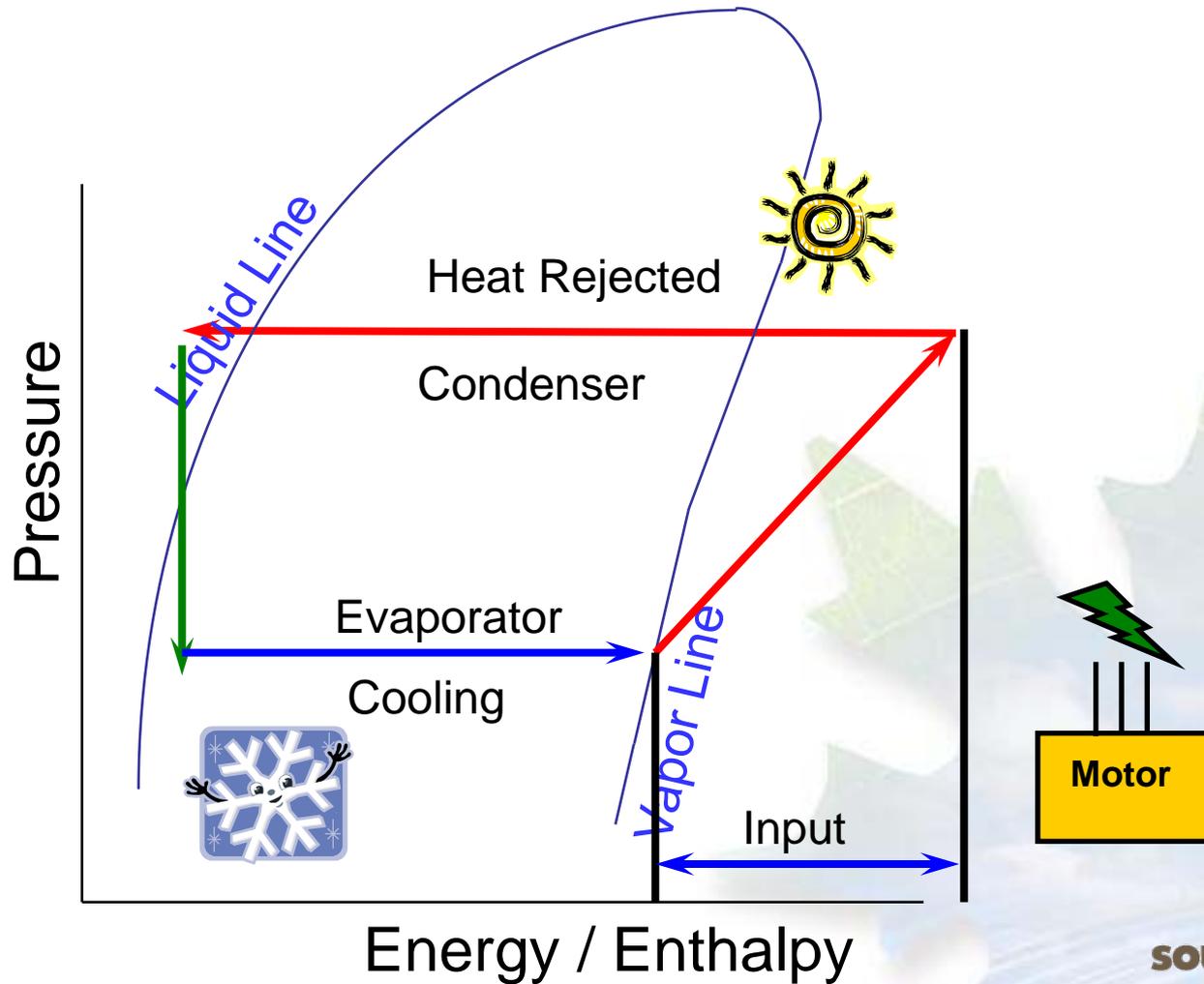
# Heat Pump Basics

# Heat Rejection

## Basic Refrigeration Cycle



# How Does it Work?

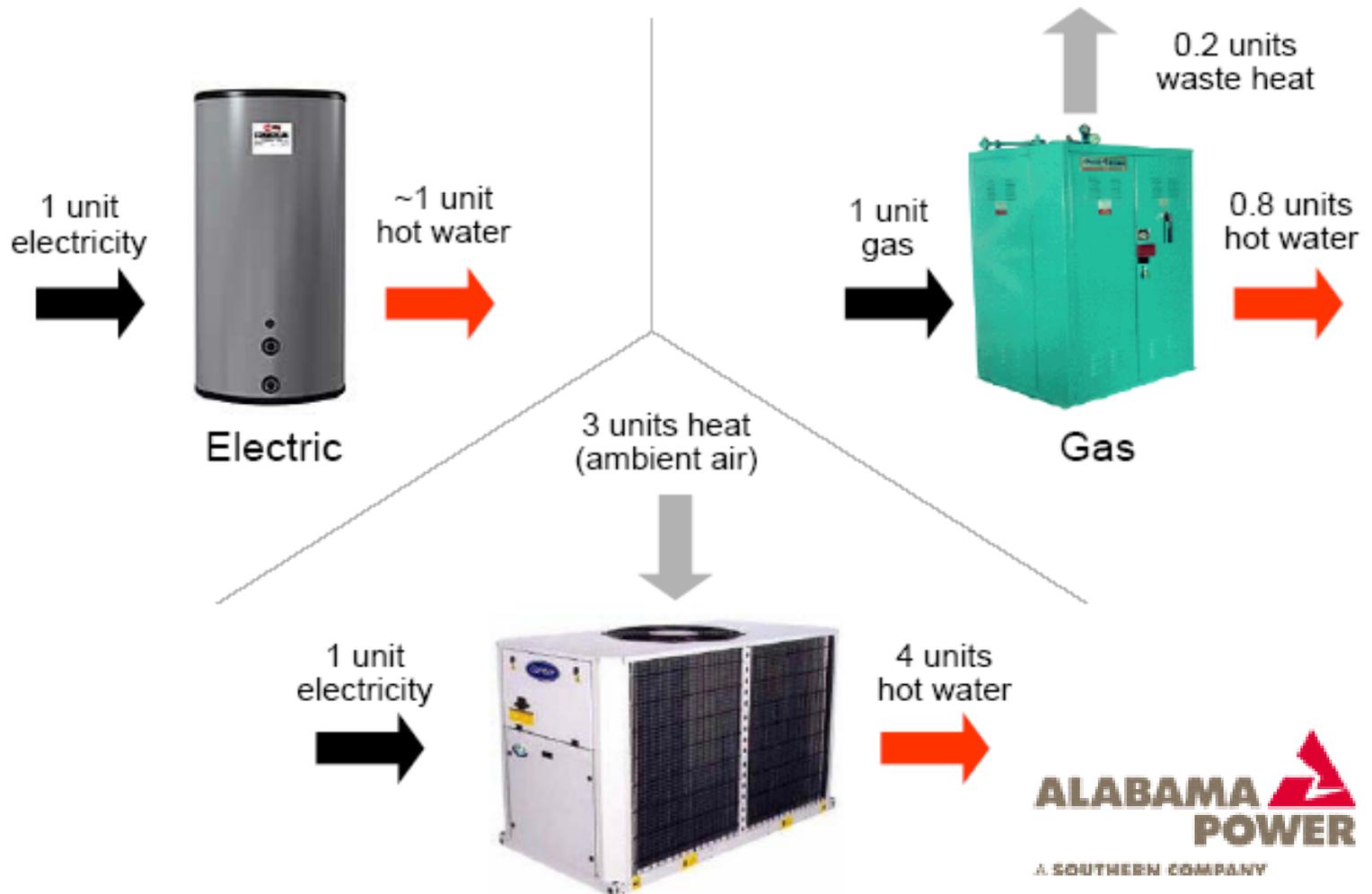




# Economics

# Performance Measurement

Efficiency & COP= Coefficient of Performance



# Cost to produce 100,000 BTU

Using:  
\$0.7/kWh  
\$10/MCF

- Natural Gas Water Heater
  - 100,000 Btu / 80% efficiency / 1000 Btu/ft<sup>3</sup> x \$10.00/1000 ft<sup>3</sup> = **\$1.25**
- Natural Gas Boiler
  - 100,000 Btu / 70% efficiency / 1000 Btu/ft<sup>3</sup> x \$10.00/1000 ft<sup>3</sup> = **\$1.43**
- Electric Water Heater
  - 100,000 Btu / 99% efficiency / 3412 BTU/hr/kW x \$0.7/kWh = **\$2.07**
- Heat Pump
  - 100,000 Btu / 380% efficiency / 3412 BTU/hr/kW x \$0.7/kWh = **\$0.54**
  - 100,000 Btu / 670% efficiency / 3412 BTU/hr/kW x \$0.7/kWh = **\$0.31**

$COP_h = 3.8$  (no cooling credit)

$COP_{c+h} = 6.7$  (with cooling credit)



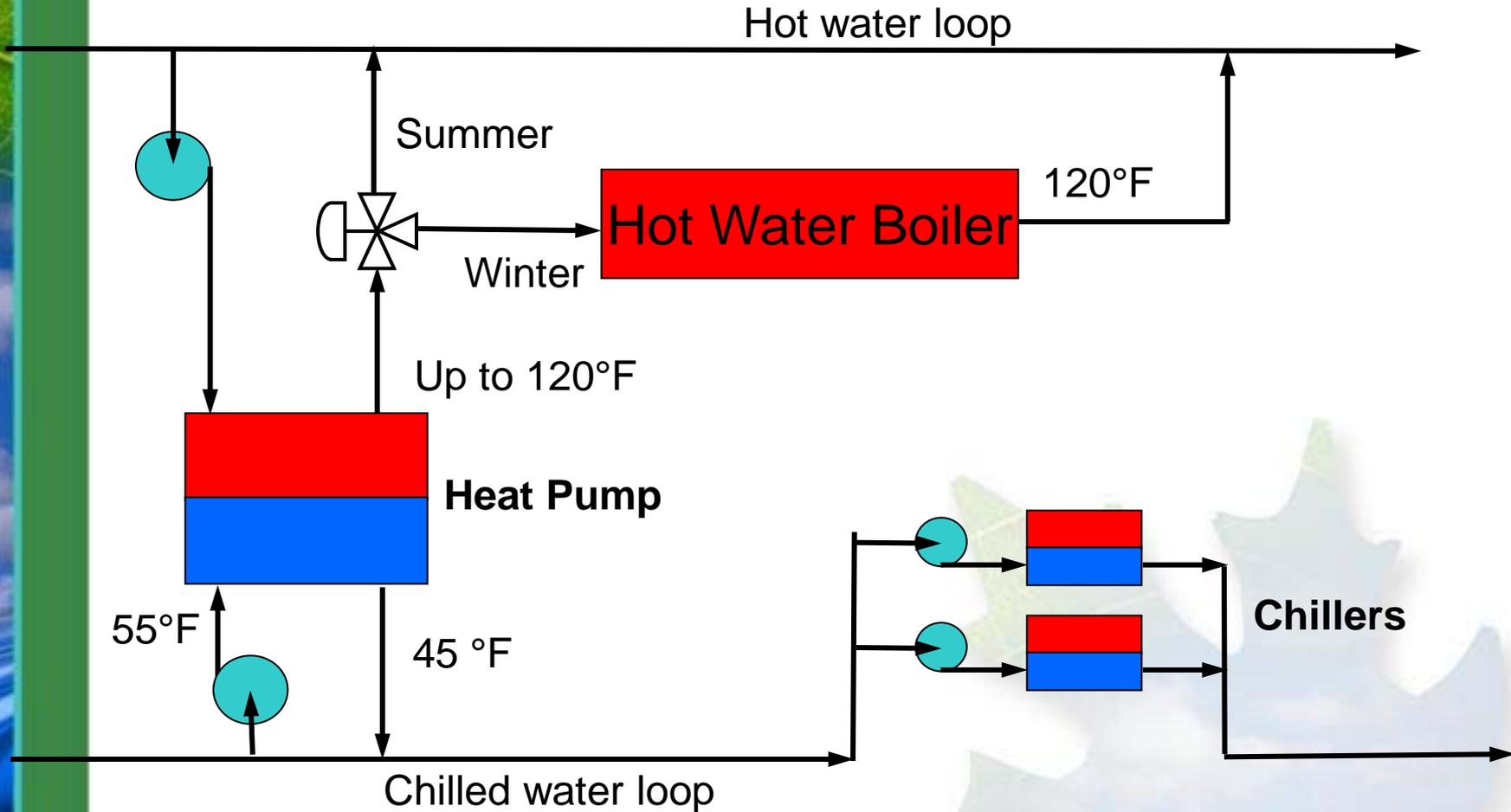
# Case Studies

# Heat Recovery Chiller – Trane

250 Ton Centrifugal - Domestic / HVAC Hot Water



# Heat Recovery-Chilled Water Return Loop



Add In Heat Recovery Chiller

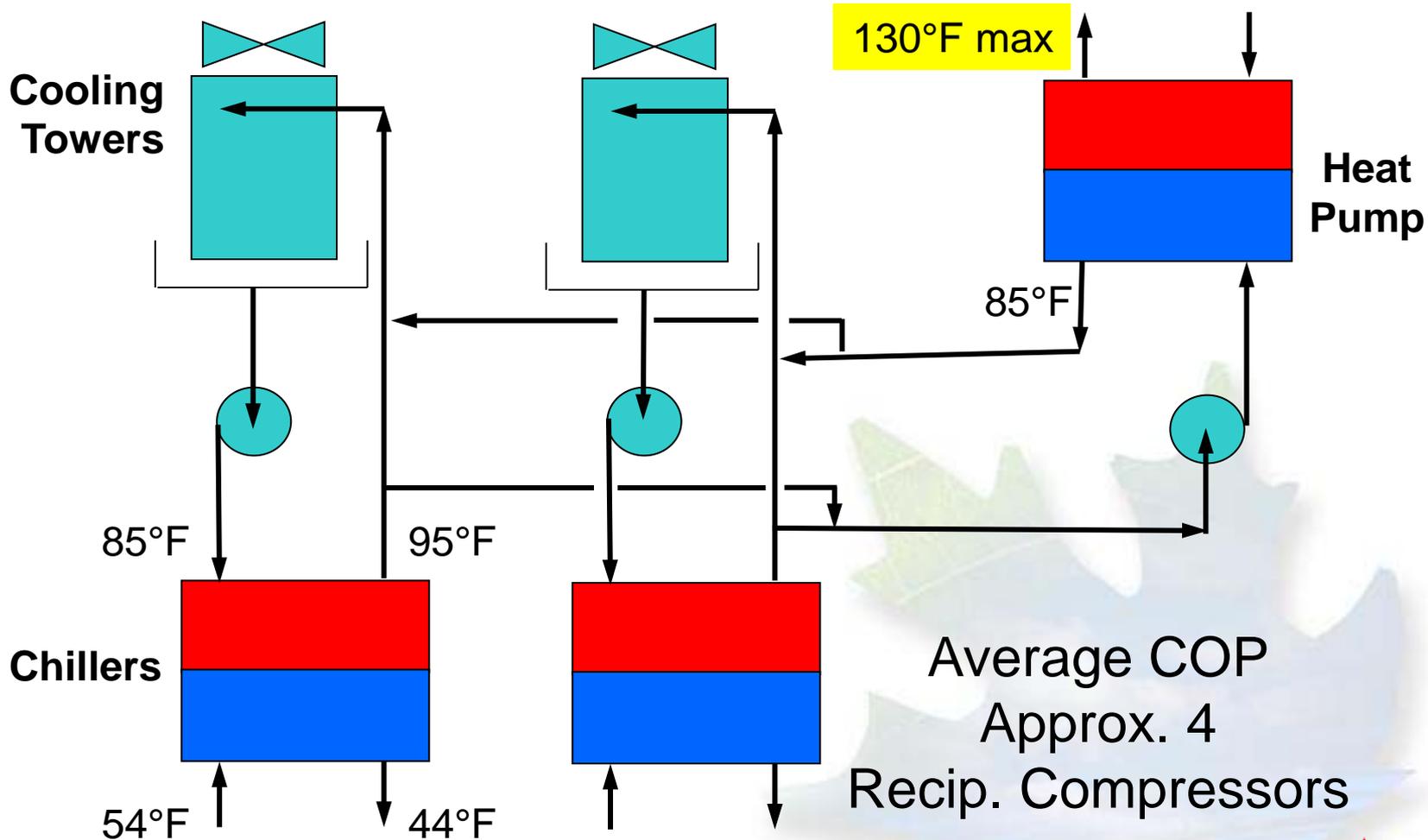
# Gordon Persons Building - Montgomery

## Heat Recovery Heat Pump

### 20 Ton - Domestic Hot Water



# Heat Recovery from Cooling Towers



# Heat Recovery Heat Pump – American Geothermal



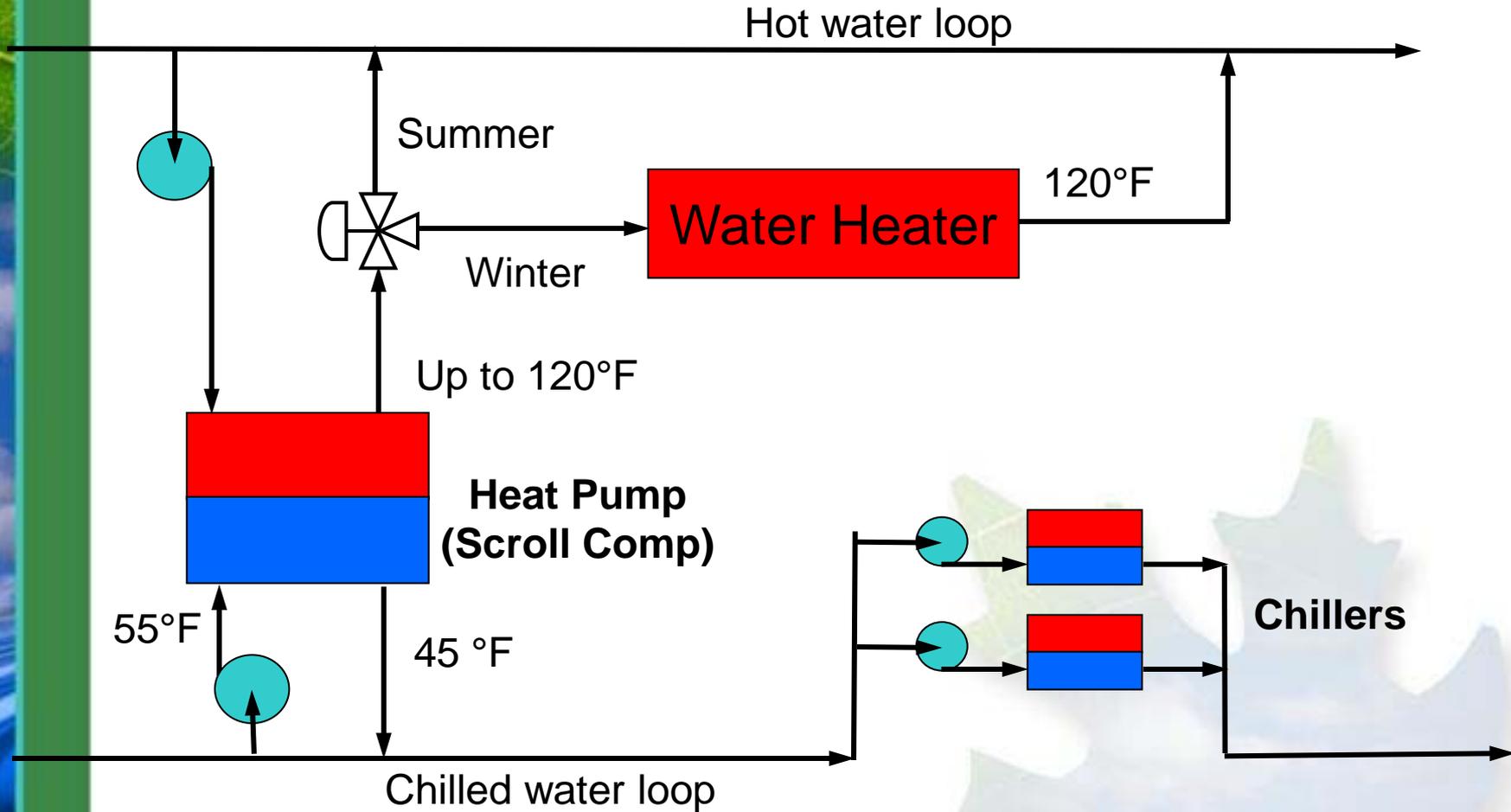
# Montgomery Convention Center

## Heat Recovery Chiller

### 30 Ton – Domestic Hot Water



# Heat Recovery-Chilled Water Return Loop



## Heat Recovery Chiller

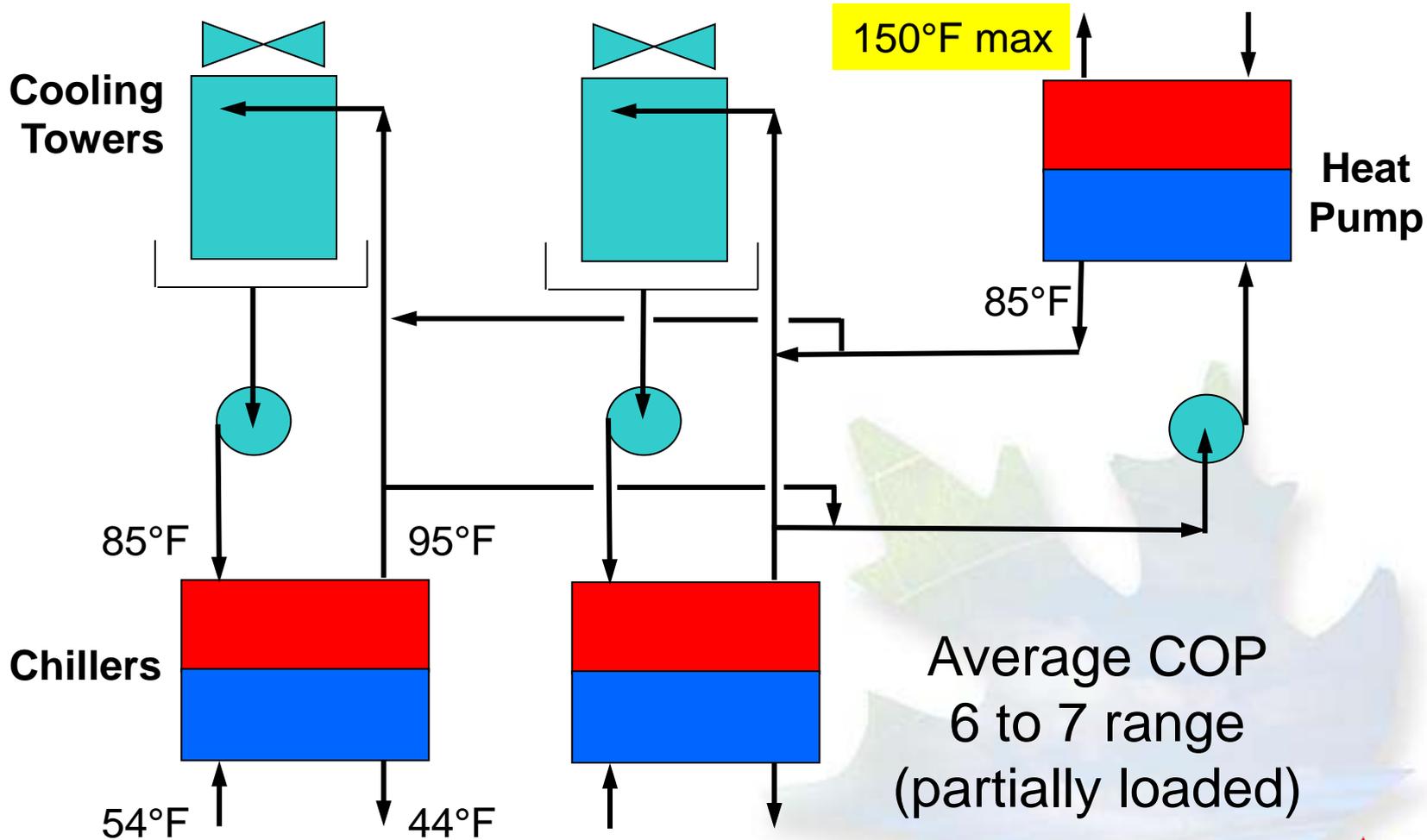
# GKN Aerospace – Tallassee

Heat Recovery Heat Pump

560 Ton – Process Heating / HVAC Hot Water



# Heat Recovery from Cooling Towers



# Heat Recovery Heat Pump - York



# GKN Project Details

Proposal –

- Install one (1) 560 ton heat recovery heat pump
- Recover waste heat from cooling towers
- Generate 150°F Hot Water
  - 1,583,672 additional kWh cost = \$96,604
  - Reduce propane consumption by 262,000 gallons

Estimated Installed Cost - \$525,000

Est. Annual Energy Savings - \$348,800

Simple Payback - 1.5 Years

CO2 Reductions - 3,321,800 lbs.

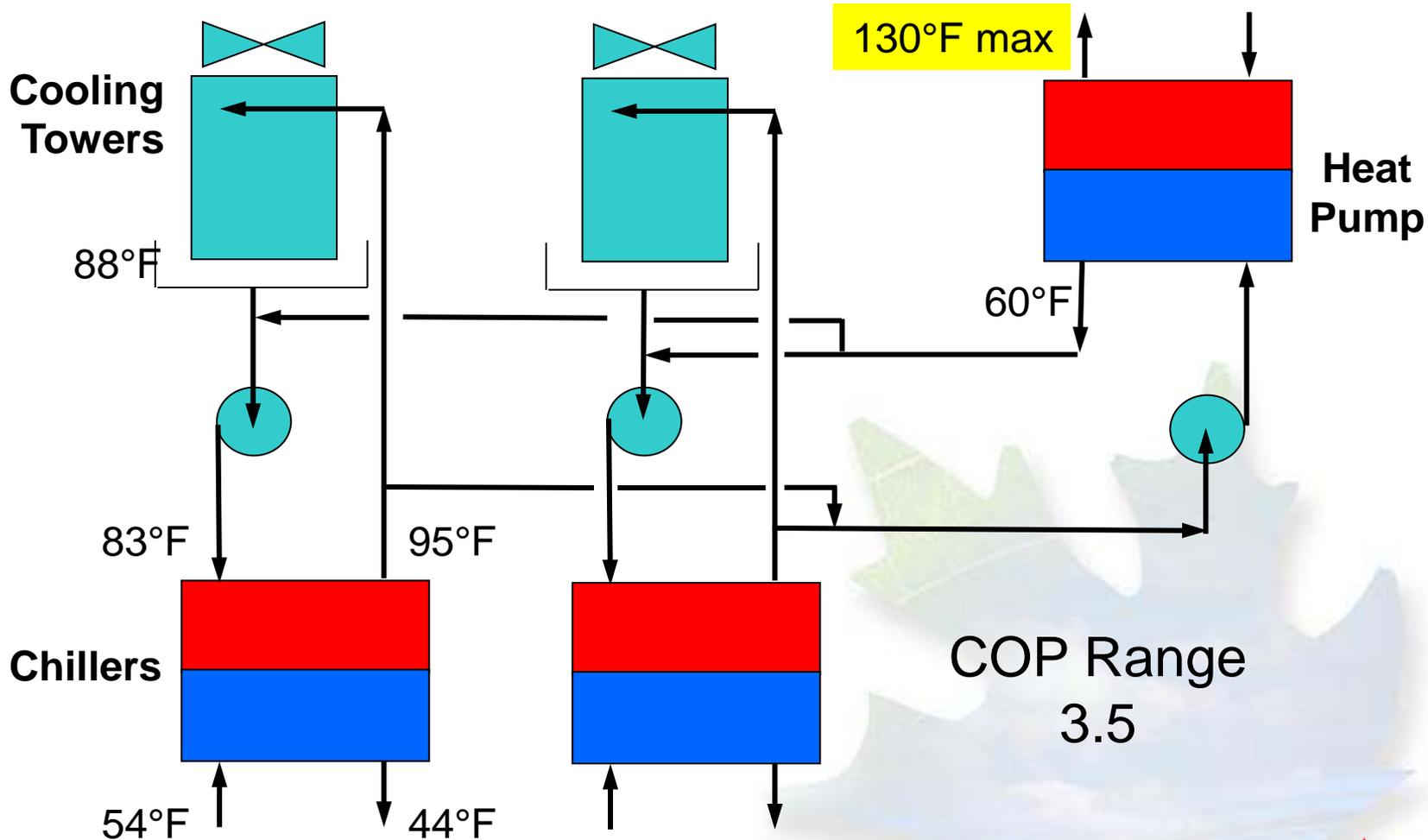
# USA Medical Center - Mobile

## Heat Recovery Heat Pump

### 30 Tons – Domestic Hot Water



# Heat Recovery from Cooling Towers



# Heat Recovery Heat Pump - American Geothermal



- Capital - \$67k
- Energy Savings - \$43k / yr
- Simple Payback – 1.6 yr

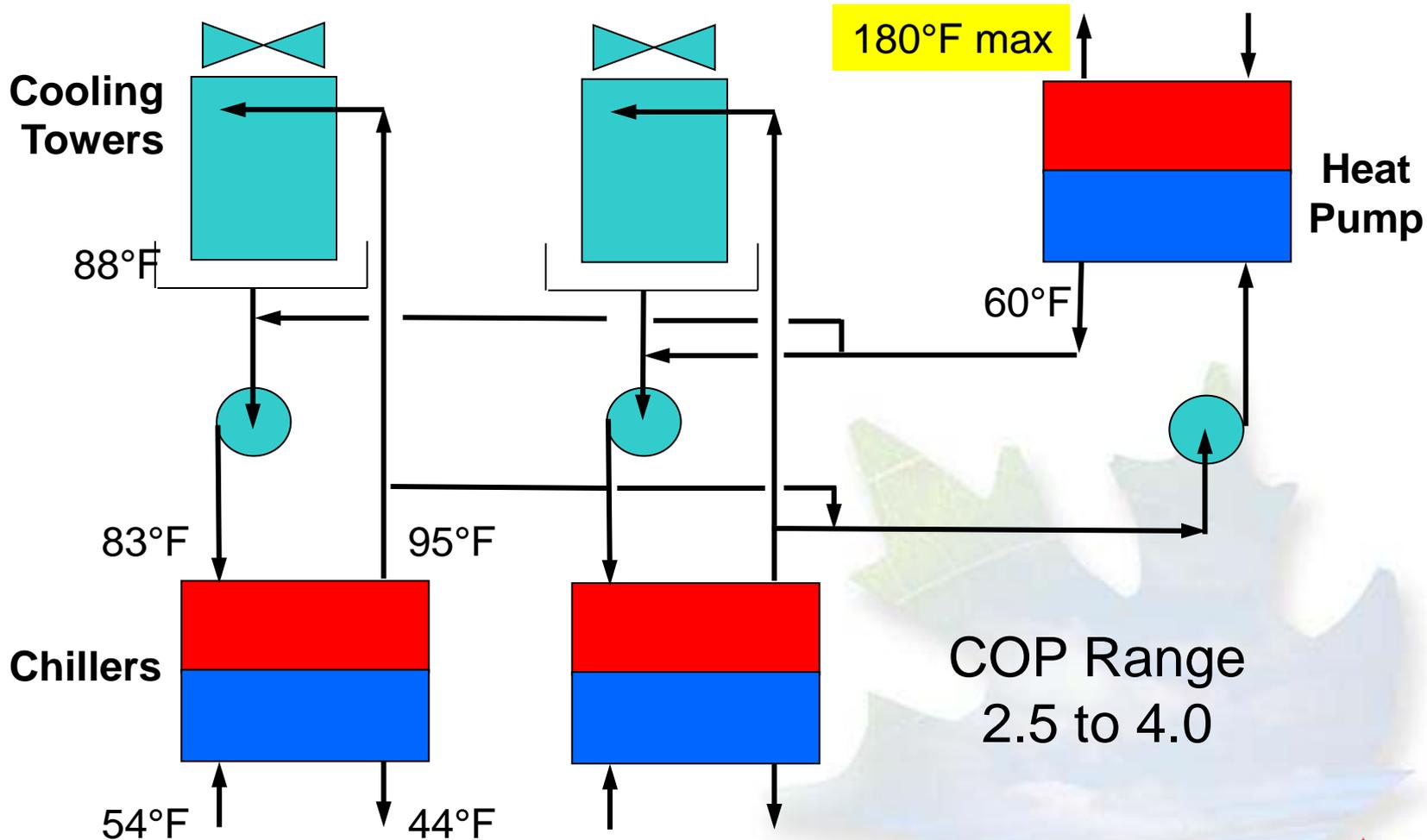
# USA Medical Center - Mobile

## Heat Recovery Heat Pump

### 250 Tons – HVAC Hot Water



# Heat Recovery from Cooling Towers



# Heat Recovery Heat Pump – Multi Stack



HVAC  
Hot Water Needs

Capital - \$443.5k  
Energy Savings - \$105.2 k /yr  
Simple Payback – 4.2 yr

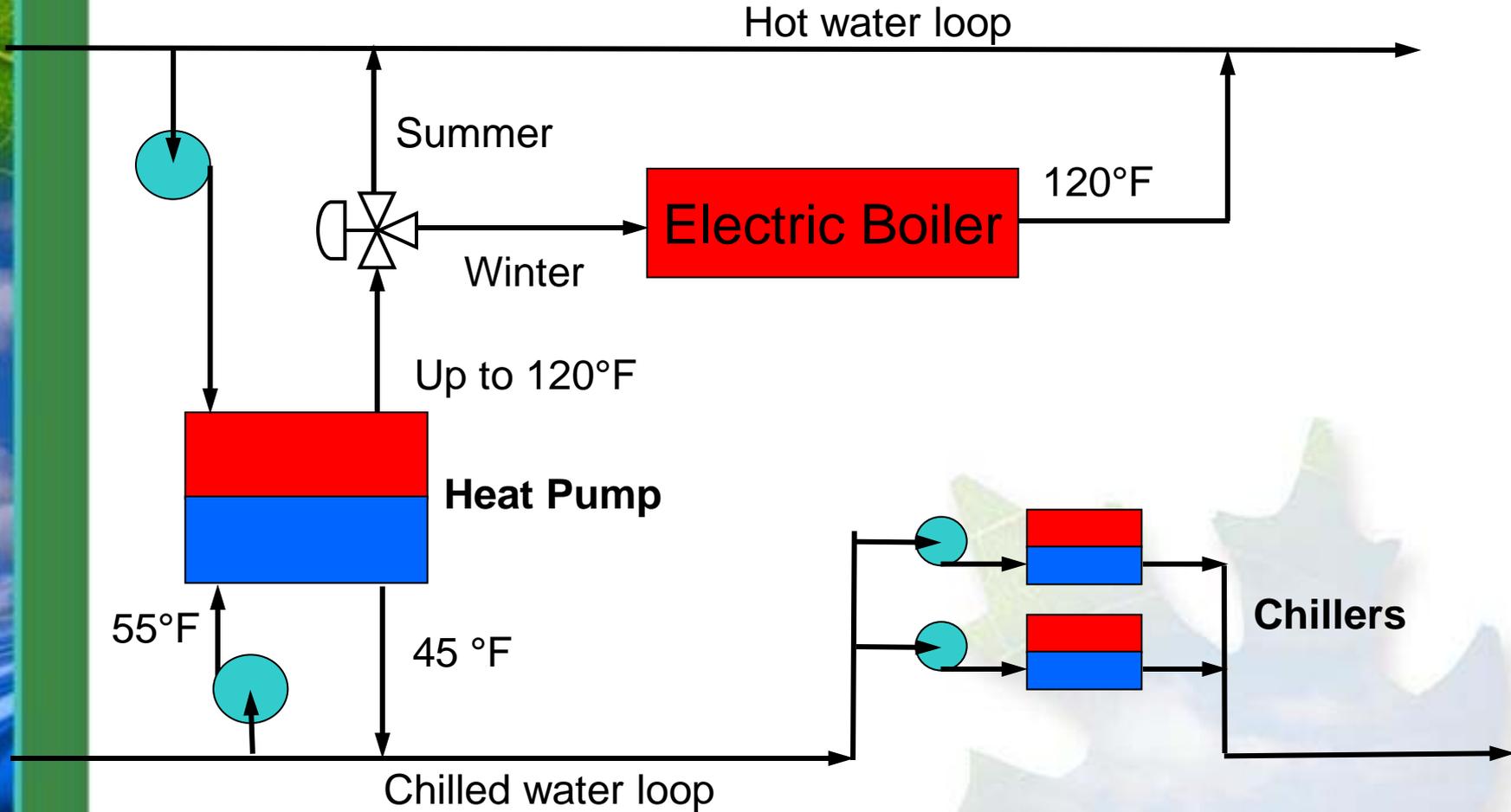


**Alabama Power  
Corporate  
Headquarters  
Birmingham**

**Heat Recovery Chiller  
120 Tons**



# Heat Recovery-Chilled Water Return Loop



## Add In Heat Recovery Chiller

# Heat Recovery Chiller Trane HVAC Hot Water Pre-Cool Chillers

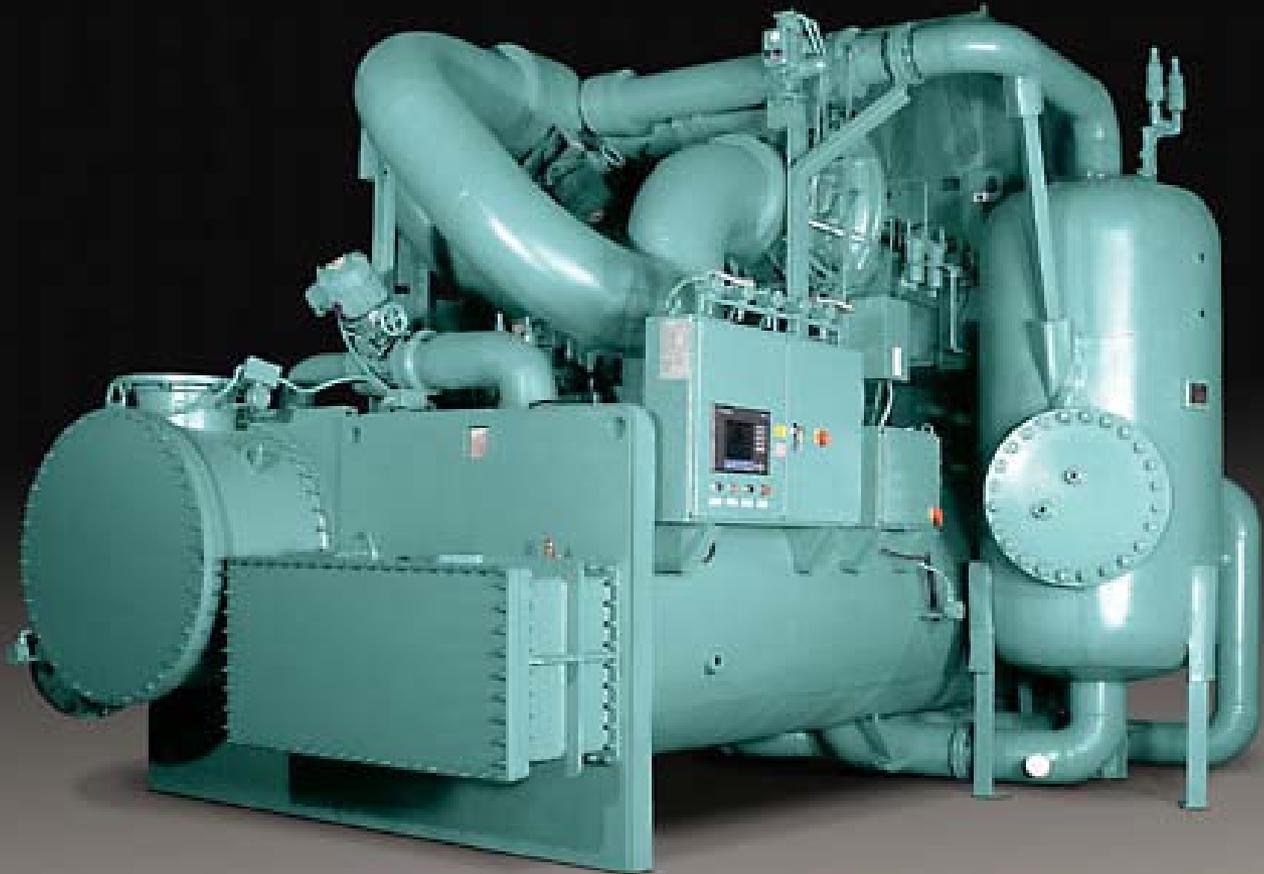


# Children's Hospital Birmingham, Al.

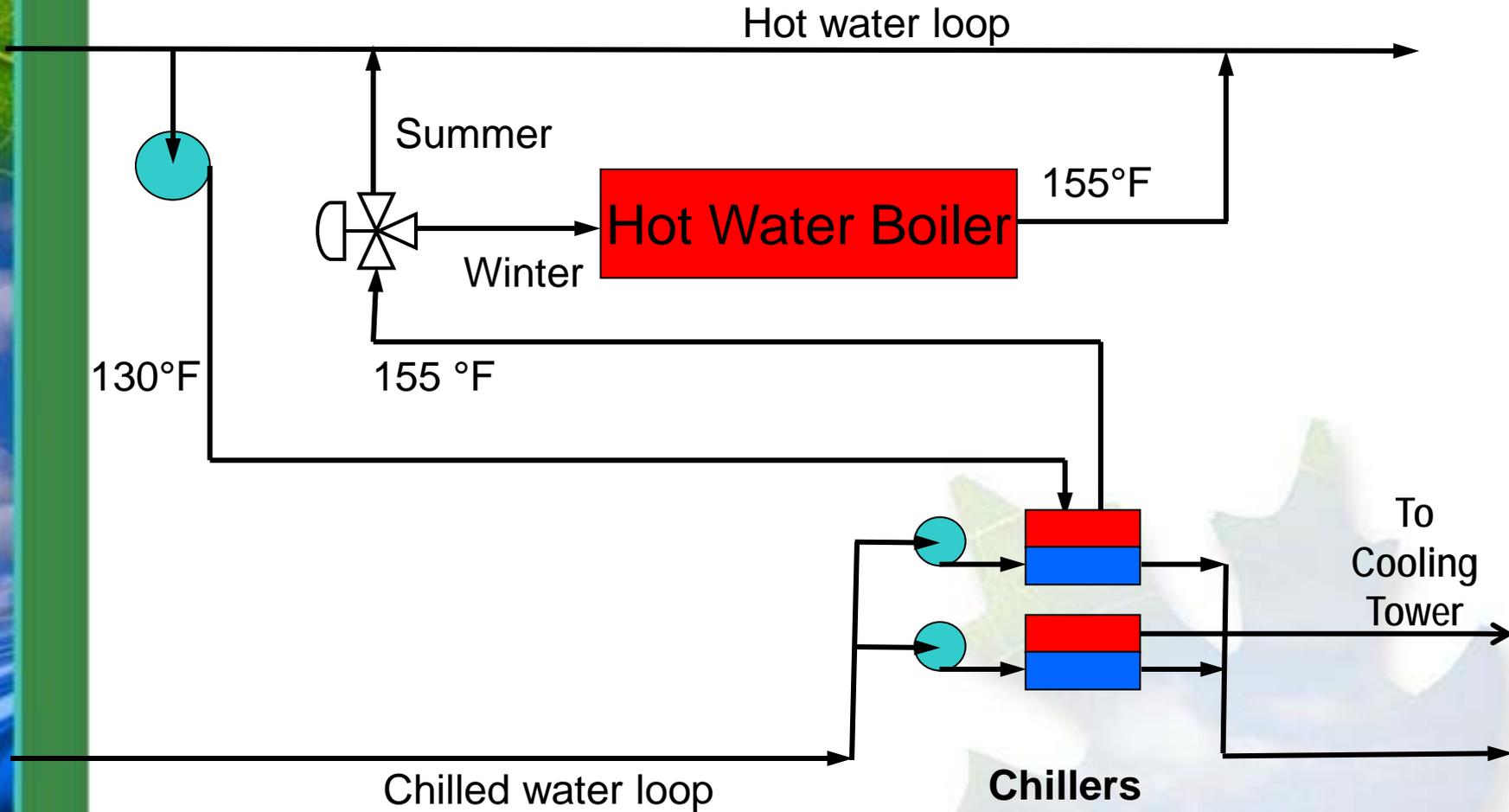
Heat Recovery Chiller  
800 Tons



# Dual Compression Heat Recovery Chiller - York



# Heat Recovery- Chilled Water Return Loop



## Base Load (Heat Recovery) Chiller

WHAT IS NEXT ?  
WHAT IS NEXT ?

# Projects Underway

- USDA at Auburn University
  - Fisheries Department
  - 35 GPM 24/7
  - Heated to 86<sup>0</sup>F
  - American Geothermal – 40 ton
- UAH – Carrier HRC
- Beau Rivage – 525 ton HRC
- TAC – Variable Speed Drive
  - American Geothermal (2 to 20 ton scroll)
  - Fall Creek Falls State Park - Tenn
- FDA – Dauphin Island



# St Michael's Hospital - Toronto

**Purpose:**

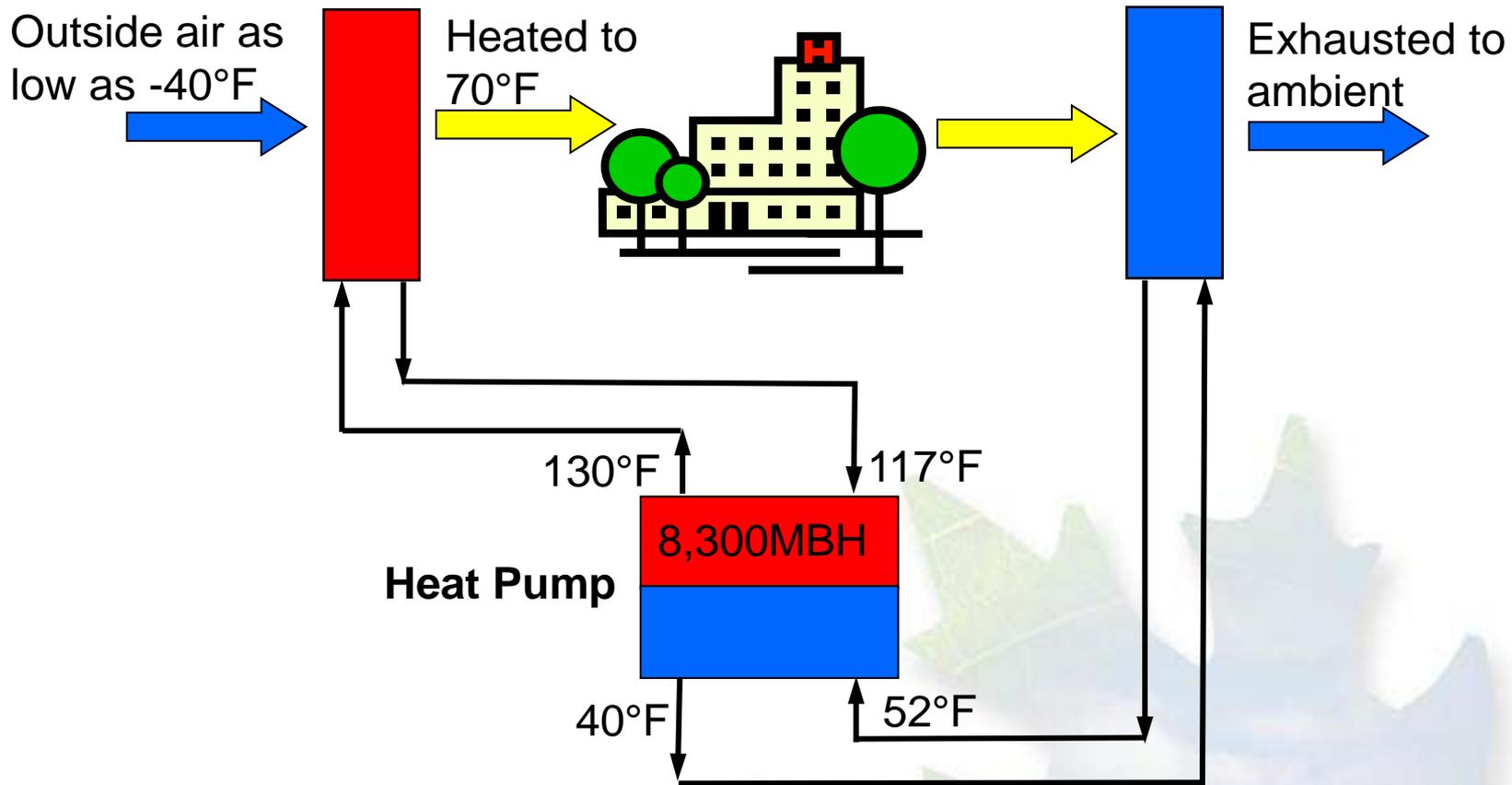
**Use waste heat exhaust air to heat incoming fresh air**



- Heat Source  
Exhaust air at 70°F
- Heat Generated  
min 8,300MBH / 2,400kW
- Inlet air from -40°F to 70°F
- Dual duty operation
  - Heat pump in winter
  - Water chiller in summer

CYKGCGCH6H0-CTCT

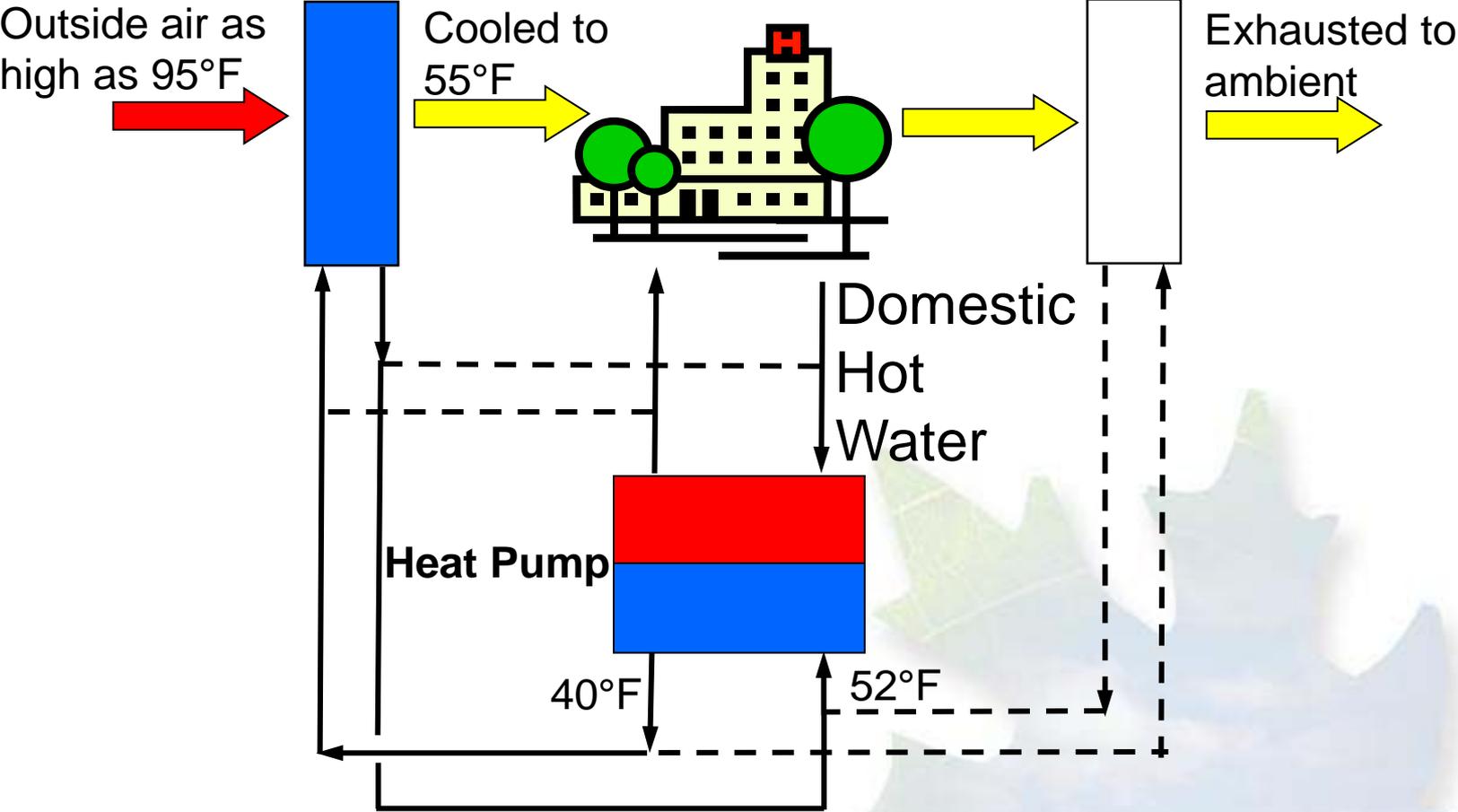
# Heat from Exhaust Air



Winter operation

Capital - \$650k  
Energy Savings - \$900k / yr  
Simple Payback - 9 months

# Heat from Exhaust Air



Summer operation



Questions?